THE MÜTTER LECTURES ON SELECTED TOPICS IN SURGICAL PATHOLOGY.

SERIES OF 1890-1.[1]

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LECTURE VIII. (CONTINUED).

CONCERNING MIXED AND SECONDARY INFECTIONS.

SYLLABUS.—*Introduction to the study of mixed and secondary infection:* Definition of the terms. Their evidences met with everywhere about the body. The most interesting effects, for the surgeon, are met with in the bones and joints. *Dysentery. Cholera. Hydatid cysts.*

MIXED INFECTION is a term applied to those collections of pathogenic organisms in which we find more than one variety of microbe. Thus in a recent tubercular abscess we may find both tubercle bacilli and pyogenic cocci; in a post-typhoid abscess both the latter and the distinctive bacillus of typhoid, or in a post scarlatinal suppuration beside the true pyogenic agents there may be found one or more bacterial forms supposed to be in some way related to the fever. In the pus of a gonorrhœal bubo, for instance, I have found beside the ordinary pus organisms the specific coccus of Neisser. Mixed infection is usually easy enough to demonstrate; it is much more difficult to make out the order of attack, though *a priori* we can usually indicate it. Post-febrile collections of pus constitute our most common and most illustrative instances. For example I have myself recognized pyogenic cocci (mostly streptococci) in post-scarlatinal intra-articular abscess, along with one or two other forms whose exact determination I could not make out. A case much like this was reported in 1884 by Heubner and Bahrdt in which retro-pharyngeal abscess and purulent synovitis were met with. There appears to be but one explanation of these cases: As the result of the impregnation of the blood and lymph by poisons resulting from the febrile disease the resistance of the tissues is diminished, and cells now succumb to bacterial invasion which before would have successfully withstood it. If one will consider the large area exposed to contact with the source of poison in cases of, say, gastro-intestinal catarrh, typhoid fever, or in the infected uterus *post-partum*, he will see how favorable is every condition for permitting such a toxæmia to take place by absorption. The peculiar effects thus due to toxæmia are discussed in another place.

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The occurrence of joint inflammations of various degrees of severity in the course of or following the various infectious diseases, has long been recognized, although their exact relationships have only been made out within the present century. Whether such inflammations were mere accidents or coincidences, or whether they bore the relationship of cause and effect, has only been cleared up since the science of bacteriology has shed light upon this very abstruse topic. For instance, the synovial effusions accompanying acute inflammatory rheumatism are among its most prominent clinical features. If now in unusual cases this effusion shall take on the purulent character so that we have to deal with an acute abscess in the cavity of the joint, it is a matter of no small importance to determine whether rheumatism by itself can ever produce abscess, or whether an entirely different and more or less independent condition has been produced. Until bacteriologists had completely established the fact that there is no suppuration without bacteria, this point could not be cleared up. As the matter stands to-day, the parasitic nature of acute rheumatism not being established, we are compelled to conclude that upon the primary condition of serous exudate there has been grafted a second and more serious condition of microbial infection of material which has already left the blood vessels. This is a fair sample of what should be spoken of as primary infection. The term *Secondary Infection* is intended to convey a somewhat different meaning. Under this name are comprised those conditions where, upon that caused primarily by bacteria of one species, there is engrafted another infection due to microbes of a different species. To illustrate this statement a little, take a gumma of tubercular or syphilitic origin in which there are no evidences of suppuration. This may exist for weeks or months in form almost unaltered. From some cause or other, be it easy or difficult of explanation, an infection of this specific granulation tissue by pyogenic bacteria takes place, and then we have the rapid formation of an abscess. Again in the lungs more or less infiltrated with tubercular tissue, the same kind of pyogenic infection takes place, and cavities or excavations are rapidly formed. (This without reference to the fact that tubercle bacilli may of themselves develop pyogenic powers). Yet another illustration: In the well-known form of gonorrhœal arthritis met with most often in the knee, numerous investigators have found gonococci in the effused fluid. It has already been shown (see Lectures III and X) that gonococci by themselves are not pyogenic. So long as no secondary infection by the ordinary pyogenic bacteria occurs, this fluid remains serous or serofibrinous; but if such secondary infection do occur, there is rapid formation of a genuine pyarthrosis. These illustrations serve better to define what is meant by mixed infection than would statements alone without illustration. By quite similar process we have the conversion of a tubercular pleurisy or pleuro-pneumonia with effusion into an empyæma; of an originally tubercular meningitis into the suppurative form, and of many other well known conditions.

De Wildt (Diss. Utrecht, October, 1889) demonstrated that the exudate from a case of serous inflammation makes an excellent culture material for pyogenic organisms by tying a broad band tightly around the base of a rabbit's ear, and then applying very hot water for a few moments to the ligated part.

The consequent serous exudate was, by the injection of small quantities of staphylococci, so affected that very quickly a profuse suppuration occurred. Control experiments without the previous irritation of the ear, gave no result. This is of interest as showing how the exudates in rheumatism are easily infected. It is furthermore known that fungous joint inflammation, in other words tubercular infection, occurs occasionally after acute rheumatic affection of the joints. This fungus condition is of course nothing but a primary tubercular infection occurring in the same way as suppuration. Upon this fungous condition may occur a second infection of pyogenic cocci, so that we have three entirely different lesions of the same joint. First, acute rheumatic synovitis; second, tubercular infection of the joint; and third, and much later, suppuration and degeneration. Not a few of these secondarily infected cases occur as results of extension of infection and embolic pyæmia. It is not difficult to account for the secondary infection in such cases. It can occur, for instance, through diphtheritic infection of the pharynx, or follicular abscess in the tonsils; perhaps more commonly from the pharynx than from any other locality. Indeed so common is such infection from unsuspected or concealed sources that Greisinger described what he called a suppurative diathesis, which had in itself much of what we speak of as hospitalism. That the system is left in a more than ordinarily vulnerable condition, with lowered susceptibility or power of vital resistance, after various acute infectious diseases, is well known. The ease with which many such individuals succumb to tuberculous processes, or the manifestation of acute so-called scrofulous lesions is only too frequent. Perhaps more than any other disease, measles leads to this condition, and Luecke, among others, has called special attention to the frequency of joint and bone diseases following soon after this disease.

I think it proper to make a distinction between *secondary* and *mixed* infection, limiting the former term to those cases where a fairly distinct sequence of events can be observed, and applying the latter term to those where complex or multiple infections occur at or about the same time. This latter I consider to be the case in many instances, as in the contraction, often, of diphtheria, gonorrhœa, puerperal fever, dissecting wounds, etc. And in other lectures in this series I have called attention to the added morbific effect of introducing two widely variant species at the same time. There is much to show, therefore, that a mixed infection is oftentimes worse than a simple form.

It is worth while to remember, in this connection, the peculiarity of the *kefir* ferment. This is complex, and is composed of three different organisms, each of which can be cultivated alone; but the peculiar fermentative action essential to the production of *kefir* is only brought about by the combined activity of all three forms.

From what has been already said, it will be more readily apprehended how some previously inexplicable conditions have been brought about. For instance, the formation of a hydrops articuli, and then the subsequent spontaneous dislocation of the joint; and an important therapeutic rule may be from such cases deduced, viz., that when a joint is so involved it needs to be handled with extreme caution, and carefully watched for a long time. Massage, which is ordinarily of so much efficiency in the dispersion of joint effusions, would be in such a case most undesirable, since by dispersion of the fluid might be precipitated a metastatic infection of various other parts of the body. So, too, with aspiration or incision for removal of the fluid. No matter how carefully performed, it would be theoretically impossible to avoid infection of tissues between skin and synovial membrane, and the path for a general infection might thus be made. If, indeed, such operative measures must be resorted to it would be desirable to follow them with intra-articular injection of emulsions containing iodoform. By such a measure not only is protection instituted, but an antidote to local infection is at the same time introduced.

The various inflammations of bone following acute infectious disease are not so often met with nor so well known as those of the joints. Nevertheless they occasionally occur, and when acute, are usually of such extreme severity that the crisis occurs within a few days at most.

Maisonneuve and Chassaignac were among the first to point out that there is a form of periostitis following typhoid, scarlatina, small-pox, etc., of frequently increasing severity, and it is mainly to the French writers that we owe our knowledge of this condition. Later Luecke showed how not merely periostitis but even more acute forms of osteomyelitis resulted from the infectious diseases. This was in 1880, while a year or two before this Langenbeck had warned the Congress of German Surgeons that surgeons generally had hitherto laid altogether too little weight upon the relationships between inflammations of bone and other acute diseases, and had paid a disproportionate amount of attention to traumatic and rheumatic causes. These observations of Langenbeck's were discussed by Ponfick in a lecture upon necrosis of bone marrow following relapsing fever. The same surgeon published in 1872 and 1873, in Virchow *Archives*, further contributions to the behavior of bone marrow in cases of typhoid fever. A little later Freund continued the studies of his teacher Ponfick, and shed much more light upon the subject. Among others Ebermaier, examining the ribs of a patient dying during the fourth week of typhoid fever, found typhoid bacilli in their marrow, and showed, as did Freund also, how favorably conditioned the marrow is for the development of such organisms. Fischer showed that in all the infectious diseases the periosteum of the entire skeleton becomes more vascular and succulent, and is detached with much greater ease than in the normal condition. In other words, the lower layer of cells of the periosteum, as well as that cellular layer which surrounds the vessels entering the bone, is attacked in the same way as the soft parts at a greater distance from the bone, and this condition is summed up in the expression that inflammation of the bone is virtually inflammation of the soft parts around it. It is not unfair to view the involvement of the bone marrow and the tissues outside of it in the same way as we view the alterations in the spleen; they are of nearly the same general character.

Neve, in an article elsewhere alluded to, speaking of a fact that organs of such size and function as bones and joints frequently suffer after septic fevers, alludes to the intimate nervous and vascular relationship of the joints with their over-lying skin, the similarity of epithelium, the rôle of the medulla in the formation of the blood and the vascularity of the sheathing of the bone; and in the case of the teeth and alveolar process their dermal origin and exceedingly active and developmental changes, by which participation in the morbid process set up by septic poisons is favored.

Authors have described a peculiar form of necrosis of the alveolar process, with more or less destruction of the jaw bone, peculiar to the eruptive fevers and much resembling that from fumes of phosphorus. In this case it would seem as if the essential nature of the lesion was a poisoning, in one case (phosphorus) from without, *i. e.*, from an extraneous source, in the other from within. Mr. Salter has called attention to a peculiar coincidence in this matter, since, in the jaw necrosis of eruptive fevers, the poison is generated in the organism and affects the teeth and teeth pulps by reason of their being dermal organs; in other words members of the tegumentary system, upon which system generally the poisons spend their chief destructive force. These cases occur commonly in children, and usually in those of low state of vitality, evident both in their general systems and their teeth. Salter has also called attention to the extremely slight changes in nutrition which occur in teeth when once they are formed, by which consequently they are removed to a large extent from possibility of repair from acute disturbances.

From the time of birth to the eighth or ninth year the jaw bones are the seat of intense development in the formation of teeth, and are among the most vascular parts of the body. About the middle of the period named, that is about the fifth year of age, the jaws contain no less than forty-eight developing teeth and tooth-germs. It is at about this time that the poisoning of the exanthematous fevers appears to exert its most marked effects upon the dental system. Salter appears to have been among the first to recognize necrosis of the alveolar edge and shedding of the teeth as one of the sequelæ of these fevers. This particular gangrenous tendency seems to be almost peculiar to the eruptive fevers, including typhoid under this heading, though even here it is very rare. In order of frequency it is most commonly met with after scarlet fever; measles and small-pox coming along second and third. Whether the gangrenous process alluded to in the above remarks is of the nature of a specific one, in other words whether it is the result of a mixed or secondary infection, or whether it be due to circulatory disturbances, is not known; nor do I know of any bacteriological researches concerning the matter.

When in the course of a purulent infection one sees the development of a suppurative arthritis, it is logical and necessary to admit the relation of cause and effect between the febrile condition and the manifestation in the joint. With this statement Lapersonne begins his monograph on *Non-Tubercular Infectious Arthritis*, a work, in the writer's estimation, of very great value. Nearly a century ago Bonnet gave up a chapter in his great work on Diseases of the Joints, to what he called consecutive rheumatisms, which he carefully warned us were not to be confounded with genuine rheumatisms. Since his time we have studied with great care blennorrhagic purulent arthritis of septic or puerperal origin, and the various arthritides which follow infectious fevers, and have arrived now at a very different period, when these matters have to be studied mainly in their bacteriological aspects. Lannelongue has made out five varieties of arthritis as follows:

1. Traumatic arthritis.
2. Inflammatory arthritis, caused by extension from surrounding inflammations.
3. Generalized arthritis due to rheumatism or gout.
4. Arthritis due to nervous or cord disease, such as progressive muscular ataxy.
5. Septic arthritis, parasitic or virulent, virtually of microbic origin, and secondary to some general disease.

This last may be regarded virtually as infectious arthritis, and is the only form which concerns us here. A few years ago Bouchard made the following statement: "Parasitism is established with certainty for four diseases of men, anthrax, glanders, tuberculosis, and malignant œdema, while it is almost established for gonorrhœa and erysipelas." It is simply an evidence of what rapid progresss we are making that within so few years, namely, about six or seven, this list has to be so greatly extended. It is necessary now only to show that a given disease is of parasitic origin, in other words infectious, to convince one that various complications may be met with during its course or after convalescence; and it is quite likely that the near future will add several names to the list as it stands to-day. For the surgeon the joint complications of these various diseases have a peculiar and wide importance, not merely because of the serious nature of many of these manifestations, nor because of their relative frequency, although abscess in the joint will be met with probably fifty times to one abscess in the liver or any of the viscera.

Another reason why these lesions stand out so prominently in our interest at present, is because since the *renaissance* of surgery which bacteriological study has brought about, we have at last the explanation of that for which, in time past, many, and sometimes absurd theories were invoked. I do not mean that everything is yet clear, but I am certainly of the opinion that matters have been greatly cleared up for us since Koch and Pasteur began their work.

One of the greatest difficulties in the study of these lesions is that of accurate classification. Is one to speak of them according to the number of joints involved, according to the disease in the course of which the lesion appears, or according to the organism which appears to be particularly at fault? In other words, shall one speak of a mon-articular or bin-articular, or of a post-typhoidal, or of a bacillar abscess, or how? It seems to me that the best nomenclature is that which I have tried to use throughout this essay, and to speak, for instance, of a mon-articular post-gonorrhœal synovitis, or a post-puerperal poly-articular purulent arthritis; endeavoring to convey in the fewest possible words the largest amount of information.

As a matter of fact not until the fluid or pus from these cases has been examined can we say whether common pathogenic forms or specific disease germs are the active agents. To name them, then, after this plan would be to wait some days or weeks until after a post-operative or post-mortem diagnosis could be made. Teissier and his scholars, like Griesinger, have introduced the term purulent diathesis, and by the use of it have explained certain cases of spontaneous septicæmia and pyæmia. The very term indicates the necessity of more accurate knowledge, and must be relegated to the past, although if it could be confined to a description, in an adjective sense, of lowered or increased susceptibility to certain organizations by which apparently suppuration is encouraged, providing the necessary germ to be present, it might be applicable. In 1871 Quinquand described under the name *maladie arthrito-phlegmoneuse*, an infection characterized by multiple suppurations about the joints and in the cellur tissue, and formulated the following conclusions: "There exists a disease of special nature, characterized by articular and phlegmonous lesions, which have a strong resemblance to each other, and this I propose to describe under the above name. It comprises three forms, *a*, the arthrito-phlegmonous form in which there are moderate fever, acute suppurative arthritis with rapid destruction of cartilages and epiphyses, and subcutaneous indurations which later suppurate; *b*, an articular form characterized by destructive changes limited to the joint; and *c*, a phlegmonous form in which the lesions are extra-articular, and occur in the cellular tissue. This disease is distinct from rheumatism, although it somewhat resembles it, and develops under the influence of fatigue, of certain traumatisms or burns, and sometimes from causes quite unknown." He publishes as an illustration of this disease the case of a robust man of healthy antecedents, who burned his arm one day and received an excessive fright. Soon after he had a violent chill, vomited, and became seriously ill, and developed the articular manifestations of the condition just described. Abscesses developed at various points, he rapidly grew worse, a bed-sore formed over the sacrum, delirium supervened, and the disease proved rapidly fatal. At the autopsy extensive destruction of the soft and hard tissues was found. From the standpoint of to-day it would scarcely seem necessary to erect a separate form of disease to accommodate such cases as these. Ample opportunity for infection was offered from the burned surface, while, undoubtedly, the emotional and nervous elements conspired to materially reduce his vitality. So in such a case as that brought forward by Tuffier, as one of sporadic or spontaneous pyæmia, in which a trifling uterine affection had been treated by very superficial applications of the actual cautery, which were followed by very rapid fatal purulent infection. Even so, with such a case as one with which I was myself conversant, where the only explanation for a fatal case of pyæmia was afforded by the discovery of a minute but fatal bursal suppuration under a small soft corn. Surely for such cases as these it is no longer necessary to suppose a purulent diathesis, any more than it is for a case of septicæmia following a dissection wound.

Among the first to regard these mixed and secondary infections from the clinical side was Dr. Keen ("On the Surgical Complications and Sequels of the Continued Fevers." Four Lectures, No. V. Smithsonian Collections). A lively interest in the subject awakened by his paper prompted me to report a number of cases from my own experience, in 1885 ("Some of the Surgical Sequelæ of the Exanthems and Continued Fevers," *Canadian Practitioner*, July, 1885), working still from the clinical standpoint. Since the introduction of bacteriological methods these problems have now to be studied in a very different and even more interesting light. The two monographs which most fully cover the ground, in my estimation, are those of de Lapersonne, "Des Arthrites Infectieuses," Paris, 1880, and Witzel, "Die Gelenk und Knochenentzundungen bei Acut-Infectiosen Erkrankungen," Bonn, 1890, to which I desire to acknowledge large obligations, and to which I must refer for a bibliography of the subject.

I propose to devote the remainder of this course of lectures to a consideration of these secondary and mixed infections, following the more important or common infectious diseases which have most interest for the surgeon, hoping at least to be instructive and suggestive in the effort, but not claiming that it is in any sense exhaustive of the subject.

DYSENTERY.

Dysentery is one of the special diseases whose joint complications have been recognized from the oldest times. Mild forms of this trouble have been noted in a great many cases as a common sequel; but such disturbances as suppuration in the joints are quite rare.

In Hippocrates we find the following remark:

"*Intempestive suppressa intestinorum difficultas abscessum in costis aut visceribus aut articulis inducit.*" At least three authors in past centuries have noticed actual joint suppurations in epidemics of dysentery. These are Strack, Zimmermann and De la Cloture. Experiences of the extensive epidemic which raged in Minz in 1757, and for two years later, laid the ground-work for the treatise on dysentery in which Strack expressed himself thus: "If the dysenteric poison affects only the chest it causes asthma; if the limbs, it produces arthritis; if both, abscesses." Zimmermann saw in those remedies used to suddenly check the discharges the causes of those joint pains and swellings which so frequently occurred in an epidemic during 1765 in Canton Bern. During the same year De la Cloture observed an epidemic in Caèn in which, so soon as the intestinal symptoms subsided, there were frequently suppurations in the joints which often led to anchylosis, and sometimes to death. The same author alludes also to a very fatal epidemic of the same character two years later in Forges, as a result of which a large proportion of the surviving patients remained lame, or suffered very serious pains in the extremities. He regarded these lesions in the limbs either as a metastasis, by which intestinal affection was terminated, or else as a chronic expression of the dysenteric disease. The years in the middle of this eighteenth century appear to have been marked by dysenterous epidemics of the same general nature in various parts of Europe. During one in 1776 and 1777 in Berlin, Stoll frequently observed the intimate connection of joint inflammations and dysentery; with the sudden subsidence of the latter there were frequently joint neuralgias or swellings or other inflammatory phenomena. These were very frequently spoken of at the time as rheumatic pains and swellings, which denomination appears to have been unfortunate, since there was nothing then, nor is there now, to indicate a genuine rheumatic character for these troubles. Moreover, Stoll relates that he occasionally found pus in the joints. The generally painful nature of these complications will account for the statement found in many treatises that rheumatism of the joints is an occasional sequel of dysentery. Indeed

Trousseau instituted a rheumatic form of arthritis following it. According to Trousseau, the joint symptoms were usually limited to the knee, and sometimes attained such a degree as to lead to the destruction of the capsule. A more nearly rheumatic character is given to these sequelæ by the fact that they sometimes do assume a wandering character.

Post-dysenteric arthritis has in very recent times been noted by Lecard in an epidemic at Rochelle in 1873–1874, who reported eight cases; by Aron and Joigny in 1876, who saw four cases; by Fradet, who in 1884 reported eighteen cases during an epidemic at Vincennes. Bérenger-Féraud in his treatise on dysentery speaks of diverse neuralgias and reports a case of arthritis along with conjunctivitis and cardiac complication. On the other hand observers of large experience have gone through other epidemics without seeing any such cases.

Thomas, of Tours, has furnished a rare instance of suppurative arthritis consecutive to dysentery. It occured in a lad of twelve, the violence of whose dysentery was followed by an eruption which resembled variola, on the second day articular manifestations appeared in various joints. By the fortieth day suppuration in these joints was positive. He yielded to the violence of the disease, and on autopsy nearly all the joints showed suppurative and some of them destructive lesions.

Post-dysenteric arthritis has given rise to much discussion and several theories. Thus Zimmerman was inclined to attribute it to the bad effect of drugs administered during the disease. It is still a question with certain writers whether there is a special form of dysentery, or whether there is any real identity between rheumatism and dysentery, or whether a rheumatic diathesis can be intensified by intestinal inflammation. Trousseau, for instance, admitted a rheumatic form of dysentery, while some others, like Stoll, or even so far back as Coelius and Aurelianus, believed in the identity of dysentery and rheumatism, while among the advocates of the third or latter view appears Thomas of Tours. Trousseau in speaking of the abdominal distress says that pain and tenesmus are more extreme in these cases than in those of any other form, and on the other hand it may be admitted that the great majority of these individuals present neither history of previous rheumatic attacks nor of rheumatic antecedents.

Two French writers have shed considerable light upon this subject. Huette based his work on dysenteric arthritis not only on historical considerations, but upon a description of ten personal cases. Quinquand, writing upon rheumatoid manifestations of dysentery, refers especially to the ætiological aspects of the subject. Kraeuter, referring to a complicated case of this character, held that the joint lesion, as well as the conjunctivitis, sometimes noted, depended upon a putrefaction produced by immediate resorption of fæcal material into the blood. This, written in 1871, is but a more modern expression of views held a century before by Zimmermann and Stoll.

Rheumatoid affections of the joints usually occur in the period of convalescence after dysentery in either the epidemic or the sporadic form. They occur sometimes a few days, sometimes a few weeks later, and present themselves ordinarily in much the form of a common chronic rheumatism. Sometimes, however, the attacks are quite acute. According to Raymund exposure and violence or over use are the most common causes. Mildness of disease of the dysenteric form does not necessarily secure immunity from these later complications. Almost all writers on the subject agree that it is the more acute or rapidly running attacks of the former, which produce the later.

For instance, Huette reports the following case: The sickness of the mother was mild and lasted fourteen days; soon after apparent recovery she was seized with rheumatic pains, the shoulders swelled and then the wrists and elbows; soon after these the joints of the lower extremities, especially the ankles. She was confined to bed for two months, and went on crutches for four months more. A son of thirteen had, almost at the same time as his mother, a mild dysenteric attack. One month later after his complete recovery the joints of the lower extremity were attacked, the right leg became enormously swelled, and this swelling very slowly subsided. A younger son suffered at the same time from a very severe dysenteric attack, which caused the greatest anxiety. He recovered, however, without complications.

A study of the clinical features of these cases would seem to imply that we have to deal rather with the intermediary infection of the body juices by the poison from the intestinal canal, than with a sudden flooding of the system by the same. The fact that we have no severe general manifestation before the joints are involved would seem further to bear out this assertion. In no reported case has it been mentioned that there were high fever or chill previous to the general symptoms spoken of. The joints are not usually simultaneously involved. One succeeds the other in irregular order, and severity of attack varies with different joints in the same individual. As in the case of post-gonorrhœal arthritis the knee is perhaps more commonly involved. But it by no means is the only joint attacked, and trouble is nearly as frequently met with in the other larger or smaller articulations. According to circumstances we seem to have, in these cases of post-dysenteric arthritis, degrees of severity amounting from simple arthralgia to hydrops-articuli, suppurative synovitis, and complete destruction of the articular surfaces with pyæmic manifestations and death. The effusion when serous or sero-purulent may be trifling in amount, or very extensive. Trousseau states that it may even cause rupture of the capsule. This condition appears seldom to be met with to-day in so severe a form as was described one hundred years ago. Zimmermann states that in Thurgau half the patients succumbed from joint affections, and in Berlin, during the epidemic which Stoll described, there was a large mortality, and pus was frequently found in the joints. In cases reported of so-called post-dysenteric "rheumatism," a fungous, *i. e.*, tuberculous condition of the joints affected has not yet been noted by any author. It is, moreover, surprising that with so many destructive lesions in the joints, so far as I can learn, no instance of serious primary inflammation of bone or of periosteum has been reported. Although pus has been found in so many instances, old and recent, and although Starcke, in 1877, found cocco-bacteria in fluid removed by aspiration from such a joint, I have not been able to learn of any reliable bacteriological study of such a case, and consequently while maintaining the ground that we cannot have pus without bacteria, I am unable to say whether this pus is due to infection from the ordinary pyogenic cocci, or whether a specific or common form of bacterium from the intestinal tract is capable under some circumstances of wandering so far from its proper habitat, and producing pus within the synovial membrane. Certainly between the post-dysenteric and post-gonorrhœal forms of arthritis there is a certain analogy; but as we have already learned that the gonococcus is not a pyogenic organism, and that pus in these instances is produced only by a secondary pyogenic infection, so we may learn later that serous effusion may be caused by the microbe of dysentery, but that pus is produced only as in the other instance.

CHOLERA.

I find but very little literature indicating that cholera is followed by secondary infections. It appears to be too rapid in its course and too violent. Nevertheless, that it is not exempt may appear from the fact that during a recent epidemic of cholera Poulet, of the *Val-de-Grace*, had, in making autopsies, several opportunities to meet with articular and osseous lesions. He found, for instance, in a few, an effusion of fluid, sometimes as thick as molasses, and sometimes of a marked reddish tint. He spoke of it as sometimes resembling opodeloc balsam. Sections of the synovia showed epithelial desquamation with a layer of leucocytes replacing it.

HYDATID CYSTS.

That suppurating hydatid cysts have been accompanied by abscesses in other parts has of course long been known, but whether these be truly metastatic in the ordinary acceptance of the term, or whether their explanation is to be sought for in the usual way, the clinical fact remains—as well as the pathological probability—that these, too, are cases of secondary infection. For instance Verneuil has reported the case of a child with hydatid cyst in the liver, upon which he operated by puncture; shortly after the patient was seized with vague pains about the joints, and a confluent eruption of urticaria.

Later suppurative arthritis was set up about the great toe; violent chills were noted, the abscess was opened and finally the patient recovered. In such a case we certainly have to deal with a purulent infection, and to speak here of rheumatic infection would be simply to misuse terms. Moreover in this case the cyst was not suppurating at the time when it was punctured, although possibly the source of infection may have been introduced with the instrument; but even then to account for so distant an abscess is difficult, although numerous joints were involved in much slighter disturbances. It is known, however, that injection of the most limpid fluid from such cysts gives rise in animals to septic action, and one may well stop, with such a case, to inquire whether resorption of this liquid in Verneuil's case might not have given rise to general infection, with articular localization.